THE · EXTENSION PATHOLOGIST

A NEWS LETTER FOR EXTENSION WORKERS INTERESTED IN PLANT DISEASE CONTROL

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PROGRESS IN CONTROLLING PLANT DISEASES, 1914 to 1939*

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Farmers, plant growers, and home owners all have to deal with plant-disease problems. The State extension services, through their specialists and county agents, aim to help prevent plant-disease losses, thereby increasing farm income, improving quality, and preventing wastage of products.

General Educational Improvement

In some States, extension work on this subject is highly developed, with several specialists giving their entire time to it. They have taught plant-disease control since the beginning of extension work and have built up its educational background. In other States the subject has received very little attention. Twenty-two of them have extension specialists in plant pathology at the present time.

In the early days, emphasis was on pointing out the pathological problems and on the nature of plant diseases. Much personal supervision of demonstrations was necessary on the part of specialists, and much of their work was done directly with the growers. Today, farmers and agents are much better acquainted with fundamentals and they have more information at their disposal. They see their plant-disease problems more readily, and when a new problem arises they can take hold of it themselves following the recommendations of the specialist, who can act more in the nature of an adviser than a demonstrator.

*A brief, historical sketch of plant-disease extension work covering the 25-year period since the passage of the Smith-Lever Act, May 8, 1914.

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For example, the average fruit grower of today is able to identify the commoner troubles affecting his crops. He knows, or can look up, the life histories of the parasites that are causing the troubles, and find and apply the recommended control measures. He has acquired a better working knowledge of spray materials and spray machinery, thus enabling him to purchase and to use them more efficiently and economically. He has learned to appreciate the importance of timeliness and thorough coverage in the application of his sprays.

Growth in the Use of Resistant Varieties

Great progress has been made from 1914 to 1939 in the development and use of varieties of field and horticultural crops that resist diseases. Resistant varieties offer the best solution for many disease problems if suitable material can be found and maintained. It has been estimated that the annual contribution to farm wealth from resistant varieties of 17 major United States crops amounts to not less than $60,000,000 to $70,000,000.

One of the earliest projects of the Extension Service under the leadership of the Bureau of Plant Industry's Office of Cooperative Demonstration Work, was the demonstration of the superiority of the newly developed wilt-resistant cotton and cowpea varieties in the South. Twenty-five years have seen the wilt-resistant cottons gradually improved and generally adopted by farmers for use on soils that are subject to wilt, with savings of millions of dollars. In 1939 it was estimated that 65 percent of South Carolina's cotton farmers and 75 percent of North Carolina's farmers used wilt-resistant varieties.

The history of flaxseed growing in the United States has been one of steady movement westward to new lands. After a few years in a given area the wilt disease developed to such an extent that the soil became "flax sick." The industry is now centered in the spring-wheat area, and even here it would have been wiped out long ago had it not been for the wilt-resistant varieties that were developed. Practically all of the flaxseed now grown is of those varieties.

Thatcher, a spring wheat resistant to black stem rust, was first released to farmers in 1934. So satisfactory was this wheat and so effective was the educational work connected with its introduction that within 4 years it had increased to over 4,000,000 acres in the United States and Canada. In 1939 it was estimated that 85 percent of Minnesota farmers grew this variety.

Cabbage varieties resistant to the yellows disease were developed at the Wisconsin Experiment Station starting in 1910. These have proved useful in saving the cabbage industry, not only in Wisconsin, but in other parts of the country where and when the disease has shown up in

destructive form. Many result demonstrations using these varieties in comparison with others have been conducted. Probably more than a third of the farmers planting cabbage in the Upper Mississippi Valley States are now using resistant types.

The root-rot-resistant burley tobacco, Kentucky No. 16, was released in 1936. It is estimated that in 1940 most of the burley tobacco in Kentucky was of this improved strain.

These are a few examples of the benefits from resistant varieties of crops. Aided by the experiment stations, the press, seed growers, the seed trade, and other agencies, the Extension Service has taken a very considerable part in spreading knowledge of their value.

Seed-Potato Certification

Potato-seed certification begun by two States in 1914 has expanded into a great industry with 26 States certifying from 12 to 14 millions of bushels annually. This has meant many millions of dollars to the certified seed growers, but even more important has been the increased income through the use of the superior seed by table-stock growers and home gardeners. From the very start of this great development, extension specialists in plant pathology and horticulture have been involved. They helped conceive the idea, work out the details, and with the assistance of county agents have consistently followed through with the educational program. At the present time, enough certified seed potatoes are being raised to plant over a third of the United States acreage each year. The remaining seed potatoes used are usually only 1 or 2 years removed from certification, or at least greatly improved because of the certification work.

Although certification of sweetpotatoes, tomatoes, and other vegetable crops for freedom from disease and trueness to type has not reached the proportions of the work with white potatoes, there has been considerable activity, and extension specialists have been concerned with the educational phase.

Seed Treatment Beneficial

Treating cottonseed with chemical dust disnfectants for reducing losses from seedling diseases, thus improving stands of plants and yields of cotton, is a comparatively new practice. Although the research work started about 1921, it was not until about 1936 that extension work really got under way. During 1936-1939 it has gone ahead by leaps and bounds, especially along the Atlantic seaboard where extension forces have been particularly active in teaching it. In 1938 it

was estimated that over 1,000,000 acres, or approximately one-fourth of the acreage in Virginia, North Carolina, South Carolina, and Georgia, were planted with treated seed. North Carolina estimates that nearly 12 million more dollars have been added to farm incomes from the use of this practice.

Seed treatment of cereals has been a popular and profitable lesson taught by the Extension Service during the last 25 years. Seed treatment of oats was reported as probably being the most important line of farm crops demonstrational work in 1916. At that time it was stated that county agents induced 22,762 farmers to treat seed for 708,056 acres, which resulted in an increase in yield of 11.7 bushels per acre, and that the practice was becoming universal in many counties. Today oat-smut-control methods are generally known and need comparatively little attention from the extension standpoint. The wet formaldehyde treatments were largely supplanted by dry formaldehyde treatments, and more recently by organic mercury dusts. Several resistant varieties are now becoming available, South Carolina estimating that 95 percent of their oats in 1939 were of resistant sorts.

Chemical treatments for the prevention of smut and other seed-borne diseases of seed wheat have changed greatly in recent years. The formaldehyde treatment practiced in 1914 controlled smut if done properly, but was often injurious to the seed. When the copper-carbonate treatment was introduced about 1920, it met with great favor as it did not impair germination and had several other advantages. The demonstration of this copper-carbonate method and the making of home-made equipment for applying the dust occupied much attention on the part of agents in many wheat counties. Since 1929 the organic mercury dust disinfectants have gradually taken the place of copper carbonate, and they in turn have called for special treating equipment for commercial as well as for home use. Agents and specialists have directed this evolution of cereal-seed-treating work. Wheat smut has been reduced very greatly. In 1931, 8.2 percent of the carloads of wheat inspected at terminal markets in the United States graded smutty, whereas in 1938 only 2.7 percent of the receipts were smutty. Fifteen years ago from 40 to 50 percent of the car receipts of wheat at terminals in the Pacific Northwest graded smutty, but since that time there has been a gradual trend downward, and in 1939 less than 10 percent was smutty.

Spraying Fruits and Vegetables

One of the most outstanding developments in fruit work has been the orchard spray service conducted by the State extension specialists. From haphazard spraying in 1914, orchardists have progressed to systematic spraying based on current season developments with greatly improved results.

By radio, telephone, and spray-information letters they receive timely warnings that, supplementing their basic spray schedules, help them in making their decisions. Probably 90 percent or more of eastern commercial apple growers depend on their spray information services.

To illustrate the importance of spraying and spray-service work, a check-up of results in Pennsylvania apple orchards in 1939 may be cited. Of the 430 orchards surveyed, 141 had received the complete sprays as recommended, and they showed 98.5 percent clean fruit. The 242 orchards that had not received the complete schedule showed 88.4 percent fruit free from disease, while the 47 orchards that were not sprayed had no disease-free apples whatever.

Potato spraying for disease control has developed in the eastern late-potato States from very small beginnings in 1914 to the extent that now most commercial growers are prepared to spray when it is needed. In 1939 probably 80 to 90 percent of the commercial acreage in the mid-Atlantic and New England States was protected by spraying.

A history of the development of fungicidal sprays and dusts, and machinery for applying them during the last 25 years would make interesting reading. It would show the steady and consistent work of extension forces cooperating with experiment stations on the one hand and growers and manufacturers on the other.

Fighting New Diseases

New plant diseases or new forms of old ones are constantly showing up. Sometimes public funds are made available to help fight them as in the case of the European elm disease, but more frequently those affected must work out their own salvation. In these cases the assistance of the extension specialist in plant pathology is particularly helpful.

Blue mold or downy mildew of tobacco may be cited as an example of a new disease. In 1931, this destructive blight of young tobacco plants appeared and spread rapidly, first in Florida and Georgia, and then in States farther north. Growers were alarmed on seeing their plants dying. It was something they were entirely unfamiliar with. The tried all kinds of home remedies, some proving worse than the disease itself. County agents and specialists stepped in with authentic information about the disease and during the next few years, as results of investigations of control became available, brought the information to the attention of growers through meetings, demonstrations, and in other ways. Blue mold, another disease added to the many already listed, now occurs in practically all tobacco-growing States. However, growers are learning to cope with it. Research has brought forward at least three practical and successful methods of plant-bed treatment and the State extension services are demonstrating these in order that farmers may study results and decide how best to deal with their own particular blue-mold problems.

Other examples of new diseases that the Extension Service is helping to fight are: Sugar-cane mosaic that almost ruined Louisiana's historic sugar industry between 1923 and 1927; black shank of tobacco, recently introduced into Virginia, North Carolina, Kentucky, and Tennessee; new forms of wheat smut in the far West; the x disease of peaches in the Northeast; and bacterial wilt of alfalfa. We are now confronted with a threatening bacterial ring rot of potatoes that is creating a serious problem for potato grwoers.

The fight against plant diseases is an ever-changing one. New diseases appear, old diseases take on sudden epidemic proportions, and vary according to seasonal conditions. Progress has been made in aiding farmers in this fight, but much more remains to be done to help them solve their perplexing, never-ending crop-disease problems of the present and future.

MORE WHEAT SMUT IN NORTHWESTERN STATES IN 1940

Preliminary estimates based on early wheat receipts show that smut took an upturn in the Pacific Northwest and intermountain country this year. According to B. W. Whitlock of the Pacific Coast Headquarters of Federal Grain Supervision at Portland, the figures for August indicate that the Pacific Northwest will have about 10.4 percent of the crop smutty—almost double the figures for 1939; the Utah inspection points will have about 17.4 percent smut, as compared with 12.6 percent for last year. Not only has the percentage of wheat receiving smut dockage increased, but the degree of smuttiness has "stepped up." Last year a very large percentage of the smut dockage assessed was 0.5 percent; this year almost one-third of it was over 1 percent.

A further analysis of the situation by the Portland office indicates that the upturn in smut is atleast partly due to decided increases in certain large producing areas where nonresistant kinds of wheat were grown, some of the smuttiest wheat received being early harvested, winter-sown Federation. Field surveys showed that the variety Rex continued to be resistant

The steady downward trend of smut in the Pacific Northwest since the 1931-32 season, when a high of 36.7 percent smutty receipts was reached, has been remarkable. Experiment stations and extension services have been credited for much of the improvement. Prompt application of remedial measures by farmers in the areas most concerned should undoubtedly result in holding smut down to what might be considered normal amounts.

HOT*WATER SEED TREATING SERVICE FOR OKLAHOMA WHEAT GROWERS

In Oklahoma Agricultural Experiment Station Circular 86, February 1940, K. Starr Chester describes a machine for applying the hot-water treatment to wheat and barley for loose-smut control. For the past two seasons one of these new machines has been operated successfully in Oklahoma on a demonstration and service basis. The following is a copy of the mimeographed proposal that Dr. Chester sent to county agents in arranging for operation of the treater. It was accompanied by a letter and a blank application form. It shows how the work was set up and conducted.

Directions for seed-treatment demonstrations for controlling loose smut in wheat and barley

Loose smut has been constantly increasing in wheat during recent years. Many fields in the Oklahoma wheat-growing counties show loose-smut counts from 1 or 2 percent up to 30 percent. This loss can be prevented only by the hot-water seed treatment which also controls bunt or covered smut in the same operation. The Oklahoma Agricultural Experiment Station has designed and built a portable machine for this treatment. A few demonstrations were carried on in 1939 in several counties and in Stillwater, with excellent results—no loss in germination and practically complete eradication of loose smut. The new, large-model machine will treat 500 bushels a day. Each farmer is instructed to use the treated seed for planting a separate seed block and to harvest the block for seed for the main crop the following year. In this way, one day's treatment in any community will insure 9,000 to 15,000 smut-free acres in that community in 1942.

Your part in the demonstration will be to announce the plans to your farmers, arrange a schedule for the day's work, locate a place for us to set up and get permission to use steam, water, electricity, and a place to dry the wheat (see below).

Our part in the demonstration will be to provide the machine with two operators, set it up, making all necessary connections, do the treating, run a germination test on every treated lot, and pay any necessary service charges for use of steam, electricity, and the like.

The farmer's part in the demonstration will be to soak his wheat 4 hours in unheated water, bring it to the machine, and help in loading and unloading.

The cost of the treatment will be 10 cents per bushel treated, paid by the farmer. If you provide a full, compact schedule for the day's work, so that the machine is busy all day, the cost will be only 5 cents. This expense just about covers our cost of construction and operation.

Place for the treatment. The machine must be set up close to a supply of steam, water, and electircity. A schoolhouse or other public building is a good site. A steam tractor could be used for the steam supply. It is very desirable to have the treatment near a concrete paved road. Get permission to rope off a section of this road for drying the wheat. The wheat must be thoroughly dried after treating; you can think of other ways of doing this, but the pavement is easiest and best. Don't depend on the farmer to dry his own seed if you can possibly arrange for doing it at the place of treatment. We can make steam, water, and electric connections to any reasonable distance, and we will carry a good supply of pipe, couplers, wire, and hose. Be sure to pick a place where we can dump the water from the tank (about 80 cu. ft.) after the treatment.

Schedule. We can treat 1 bushel a minute, but it would be safer to arrange your schedule for 50 bushels an hour to give margin for unforeseen delays. It is important to instruct your farmers to bring their wheat in on the time scheduled, put to soak not more than 4 hours before that time. In summer, wheat cannot stand being wet all day.

Limit of seed per farmer. Any farmer may be allowed to have treated 1 bushel for every 16 acres in wheat on his farm. This provides for a seed block that will amply take care of his entire acreage 1 year hence, and in justice to others who want to take advantage of the treatment, we cannot promise to treat more than enough for a seed block for each farmer.

Demonstration materials. The ground will be laid for the treatment by newspaper material (A. and M. Clip Sheet, sent to all Oklahoma editors), and an illustrated article in the Farmer-Stockman (August 1 or 15). Be sure and familiarize yourself with the difference between bunt or covered smut (prevented by seed dusting) and loose smut (prevented only by hot-water treatment--seed dusting will not control loose smut). Ample demonstration material will accompany the machine. A very small amount of such material is available on request to the Department of Plant Pathology, Oklahoma A. and M. College, Stillwater. We can supply plenty of our circular Wheat Smuts and Their Control, and of the circular describing the new machine, Oklahoma Agricultural Experiment Station Circular 86.

Barley treatment. Most barley smut is controlled by seed dusting with Ceresan but to get a thorough elimination of smut in barley the hot-water treatment is necessary. We can handle barley with the machine but in that case do not plan to treat more than 40 bushels of barley an hour, as the treatment is longer than for wheat. If you plan to treat any barley, have it all come together in the same section of your schedule, as we have to change gears and temperature for the barley treatment.

EXPERIMENTAL CONTROL OF CROWN GALL IN THE PEACH NURSERY BY CALOMEL DIP

For at least half a century, crown gall, Phytomonas tumefaciens, has been a disease of major importance on peach trees in many nurseries. In the absence of practical control measures, nurserymen have not attempted to combat this disease. It is of interest, therefore, to report that recent experiments in control offer considerable promise. These experiments have dealt with (1) The effect of a calomel dip on the pits; (2) the effect in increasing the amount of crown gall when lime is applied to acid soils. Lovell, Muir, and "native" pits have been used.

The results of the second season's test on the use of a calomel dip on pits have now been obtained; they confirm those of the preceding year. This control method can now be recommended with a considerable degree of confidence because the results are so clear-cut. In the 9 calomel-treated plots, 4 percent of the 693 seedlings had crown gall; in the 9 nontreated plots, 58 percent of the 832 seedlings had crown gall. This reduction in stand in the treated plots was due to mole injury.

Attention is directed, however, to the fact that these seedlings had not been budded, but were dug as 1-year-old plants. Furthermore, the pits were planted in soil that had been limed and artificially inoculated with the crown-gall organism only in the 6-inch-wide furrows in which the pits were planted. Consequently, practically no galls occurred on the side roots under these conditions. These facts should, of course, be given consideration in evaluating the results, but because under nursery conditions so many of the galls are located on the crown of the roots, and also because many of the side roots that exhibit galls can be judiciously pruned, it is reasonable to assume that somewhat comparable control would be obtained under nursery conditions.

The control treatment consists in dipping for several seconds the hard, uncracked pits in a thoroughly stirred water suspension of calomel at the rate of 4 ounces of calomel to 1 gallon of water. The treated pits should be allowed to become surface-dried before planting. The object is to have the pits thoroughly coated with the calomel; the calomel should be stirred as each batch of pits is dipped.

In these experiments the pits were suspended in open-mesh cotton sacks, but, undoubtedly, better methods for treating large lots of seeds will be devised. The question as to the number of times the dip can be used and the proper strength of the suspension will be largely a matter of judgment. If the pits are reasonably clean and the suspension remains reasonably white, the same dip can be used as long as it lasts.

As there is apparently no danger of reduction in stand as a result of the treatment, it is suggested that those nurserymen who encounter losses from crown gall might readily treat about 10 bushels of pits this fall and plant these treated pits for comparison with nontreated pits. For this purpose 1 pound of calomel should suffice, and the expense involved would be negligible. Such plantings, performed in various parts of the country, would serve as a test on the efficacy of the treatment.

In the third season's trials on the increase in the amount of crown gall when artificially infested acid soils are limed, the results, in harmony with those of the preceding tests, were as follows: Eight limed (pH 6.6 to 7.0) plots, 773 trees examined, 52 percent crown gall; eight nonlimed (pH 4.6 to 4.8) plots, 708 trees examined, 4 percent crown gall. It is evident that lime should not be applied in nurseries growing peach trees except under unusual conditions. It is probable that this precaution would be applicable to other stock in those nurseries where crown gall is a p roblem.

--E. A. Siegler and J. J. Bowman
in American Nurseryman, October
15, 1940.

DID YOU KNOW THAT —

The Welles Club Toy Shop, a nonprofit organization sponsored by the Men's Club of Christ Church, Red Wing, Minn., has made up and sold some 150 Minnesota Seed Grain Treaters during the last 3 years. They make them on order for local farmers and sell them for $3.50 each, which is about the cost of materials.

Blighted, smutty, or ergoty barley is not eligible for crop loans from the Commodity Credit Corporation under the 1940 program.

More than 20,000 Indiana farmers and vegetable growers are using the yellows-resistant varieties of cabbage.

An economical and convenient kodachrome slide viewer and filing system is on the market. The viewer consists of a black, take-down, cardboard box about 7½ by 8½ by 10 inches in size, in which an electric light bulb can be inserted. Heavy 8½- by 11-inch cardboard holders, each containing 12 transparencies, are provided either for filing slides or for viewing them when placed in the front of the display box.

Frank Farmer of The Southern Planter says,

"What goes up must come down, but when acre yields go up, its production costs that come down."

PERSONNEL CHANGES

The following changes in Extension personnel took place in North Carolina, effective July 1, 1940:

Dr. Luther Shaw resigned as extension plant pathologist to accept appointment as plant patholgist with the experiment station and professor of plant pathology with the college. Dr. Shaw takes the place of Dr. R. F. Poole who resigned to become President of Clemson Agricultural College, Clemson, S. C.

Howard R. Garriss was promoted from assistant extension plant pathologist to extension plant pathologist.

Don E. Ellis was employed as extension plant pathologist on a two-thirds time basis. The remaining one-third of his time will be devoted to research on vegetable diseases supported by Experiment Station funds.

In Nebraska, Dr. J. E. Livingston was appointed extension plant pathologist on half time, effective July 1, 1940. The other half of his time is devoted to investigation of cereal and bean diseases as

assistant plant pathologist with the experiment station. Dr. Livingston took his undergraduate course and work leading to the master of science degree at the University of Nebraska. His studies leading to the doctor's degree were pursued at the University of Missouri.

From June 1 to September 30 of this year Dr. C. C. Allison, extension plant pathologist in Ohio was assisted by Mr. C. W. Ellett. In addition to identifying specimens and assisting in office and laboratory, Mr. Ellett took part in the cereal disease survey, fruit disease and insect check-up, preparation of exhibits, and in many other ways helped with the extension project. Mr. Ellett earned his bachelor of science degree from Kent State University, Kent, Ohio, in 1938; his master of science degree from Ohio State University in June 1940, and is now working toward his degree of doctor of philosophy at the latter university.

Dr. Robert A. Jehle, part-time extension specialist in plant pathology with the Maryland Extension Service, has been appointed professor of plant pathology and State plant pathologist in the place of Prof. C. E. Temple, who retired on October 1, 1940, to go into private work. Dr. Jehle will be in charge of teaching, research, and extension work in his subject at the University of Maryland. Recent additions to his staff as instructors have been Carroll E. Cox, a graduate of Virginia Polytechnic Institute, and Wilbur D. McClellan who has completed his requirements for his degree of doctor of philosophy at Cornell University. They will specialize on diseases of truck crops and ornamental crops, respectively.

MEETINGS

At the Philadelphia meeting of the American Phytopathological Society, the Committee on Extension Work and Relations will sponsor a forum discussion session on diseases of forage crops, Saturday afternoon, December 28. All interested are invited.

At Philadelphia the same Committee on Extension Work and Relations is calling a "get-together" of extension plant pathologists, and any others who may be especially interested in extension work in this subject. The general subject will be, The Possible Effect of the World and National Situation on Extension Work in Plant Pathology.

The Association of Southern Agricultural Workers meets at Atlanta, Ga., February 5 to 7 and, as usual, the Southern Division of the American Phytopathological Society and the Cotton Disease Council meet at the same time. Dr. Luther Shaw, secretary-treasurer of the Southern Division, Raleigh, N. C., has requested that titles and abstracts of papers be sent to him; and the cotton-disease papers to Dr. W. H. Tharp, Fayetteville, Ark., at an early date.
